5.6 **BARRIERS**

Shelter belts, shrubs, grasses, and annual crops have been used as vegetative barriers to reduce wind speed. To describe the impact of the barrier on wind erosion, the barrier was assumed to protect the downwind surface for a distance equal to 10 times the effective height of the barrier. This rule is valid for one wind speed, one barrier density, and one surface condition.

A barrier is most effective when it is perpendicular to the erosive wind. For most regions of the country, wind directions are not constant. In RWEQ, erosion is computed along the path of the dominate wind direction. Erosion is also computed for the two directions 90 degrees (perpendicular) to the dominant wind direction, and for the direction that is 180 degrees (opposite) to the dominant wind direction. These erosion computations are added to determine total erosion for every time period.

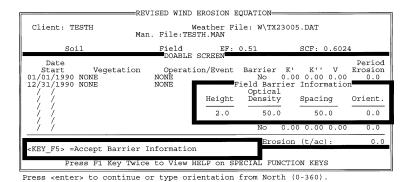
In RWEQ97, a new barrier routine has been developed that permits the input of wind speed, barrier height, spacing, and optical density (OD) to compute the protected zone downwind. This routine uses a measured or estimated optical density of the barrier along with the effective height.

To demonstrate the influence of barriers on wind erosion the basic management input file (TESTH.MAN) is used with the weather file for Big Spring, Texas (TX23005.DAT) or a modified weather file (MODPPR.DAT). (Table 5.6.1.) This modified weather file is the Big Spring, Texas weather file which was modified by setting the wind directions to 0° , the preponderance values to 10, and the positive parallel ratios to one for each month. The soil properties in TESTH.MAN are for a sandy loam (64% sand, 26% silt, 0.5% organic matter, and 3% calcium carbonate, no rocks). The field geometry is a square (660 feet x 660 feet), 10-acre field with no hill. The barrier inputs are added to the **DOABLE SCREEN** by pressing F9 under **Barrier**. The barrier data is input in the **Field Barrier Information** screen (Figure 5.6.1).

Table 5.6.1

	ent: TE				M OR s s o c	RWEG R FILE: WTX and ilt rganic matter alcium carbonate ock cover	1-4	005.	<u>ъа</u> т		JAGEN d Geom	etry:	shape area orient	ation	- -	ircula	r & .	rectar acre	gular		
	Longitud	le			Latitude_		Е	levatio	on			A	nnua	Rain	fall_				_		
DATE	Residue	Yield	GETAT	" Stems	Growing Crop	Implement	Mod. Rough.	PERAT RR			Orient.	Kill Crop	% Flat	% Stand.	1	Rate		Ht.	BARI		S Orient.
1/1/98	NONE	-		-	NONE	NONE	N	1	-	-	-	N	-	-	-	-	-	z	50	50	0
12/31/98	NONE	-		-	NONE	NONE	N	1	-	-	-	N	-	-	-	-	-	z	50	50	0
6111																					
				14																	
						- Children															

Figure 5.6.1.



For this example the client file TESTH is called into the program. To show the effect of height, spacing, and optical density the TX23005.DAT weather file is used. The modified weather file (W\MODPPPR.DAT) is used to show the effect of barrier orientation.

Table 5.6.2. Erosion estimates with TESTH.MAN and TX23005.DAT on square, 10-acre, sandy loam field. With *no* barriers the erosion estimate is 367.3 t/ac.

When optical density = 50%, spacing = 50 feet, and barrier orientation 0° ,

Barrier height, ft	2	5	10
Erosion estimate, t/ac	211.8	140.1	78.5

When height = 5 feet, spacing = 50 feet, and barrier orientation = 0° ,

Optical density, %	10	50	100
Erosion estimate, t/ac	182.0	140.1	129.6

When height = 5 feet, optical density = 50%, and barrier orientation = 0° ,

Barrier spacing, ft	10	50	100	200
Erosion estimate, t/ac	86.2	140.1	197.7	263.9

If the optical density is 50 % and the barrier spacing is 50 feet, increasing the barrier height from 2 to 10 feet decreases erosion from 211.8 to 78.5 t/ac.

If the barrier height is 5 feet and spacing is 50 feet, increasing optical density from 10 to 100% (100% is a solid barrier) decreases erosion from 182.0 to 129.6 t/ac.

If the barrier height is 5 feet and the optical density is 50 %, increasing barrier spacing from 10 feet to 200 feet increases erosion from 86.2 to 263.9 t/ac.

Table 5.6.3. Erosion estimates with TESTH.MAN and W\MODPPR.DAT on square, 10-acre, sandy loam field. With *no* barriers the erosion estimate is 373.9 t/ac.

When height = 5 feet, optical density = 50 %, and spacing = 50 feet,

Barrier orientation, °	0	30	45	60	90
Erosion, t/ac	372.1	113.2	24.6	13.2	2.7

If the barrier height is 5 feet, the optical density is 50 %, and the spacing is 50 feet, changing the barrier orientation from 0 to 90° decreases erosion from 372.1 to 2.7 t/ac.

The effectiveness of barriers is largely dependent on the preponderance values in the weather file. The more dominant the wind direction, the greater the benefit from orienting the barrier perpendicular to the wind, reducing barrier spacing, increasing barrier height, or increasing barrier density.